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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/328,646	06/09/1999	SHI-QING WANG	30-4687(4780	7096

7590

08/14/2002

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EXAMINER

VU, HUNG K

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 08/14/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/328,646	WANG ET AL.	
	Examiner	Art Unit	
	Hung K. Vu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 May 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8, 11, 12, 15, 16, 19, 20 and 23-31 is/are pending in the application.
- 4a) Of the above claim(s) 1-8, 11, 12, 15, 16, 19 and 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 23-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Continued Prosecution Application

1. The request filed on 05/30/02 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 09/328,646 is acceptable and a CPA has been established. An action on the CPA follows.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 23-31 are rejected under 35 U.S.C. 102(e) as being anticipated by Ross (PN 6,207,555, of record).

Ross discloses, as shown in Figures 5, 10, 18 and 26, an integrated circuit structure which comprises a substrate (2) and an organic layer (4) on a surface of the substrate which comprises a pattern of metal lines on the substrate and an organic dielectric on the substrate surface between

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the metal lines; and an inorganic layer (14,26,28) on the organic layer which comprises an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof, having metal filled vias therethrough which connect to the metal lines of the organic layer; wherein the hydrogensiloxanes have the formula $[\text{HSiO}_{1.5}]_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y = 1 to about 3, and n = 1 to about 4,000.

With regard to claim 24, Ross discloses the structure comprises,

an additional organic layer on the inorganic layer which comprises a pattern of additional metal lines on the inorganic layer and an organic dielectric on the inorganic layer between the additional metal lines;

an additional inorganic layer on the additional organic layer which comprises an inorganic dielectric having metal filled vias therethrough which connect to the additional metal lines of the additional organic layer.

With regard to claim 25, Ross discloses the structure comprises on or more further alternating organic layers (c) and inorganic layers (d) on the additional organic layer (c) and inorganic layer (d).

With regard to claim 26, Ross discloses the structure further comprising an organic dielectric layer on the inorganic layer between the vias and under the additional metal lines of the

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additional organic layer; and an inorganic dielectric on the organic dielectric layer between the additional metal lines of the additional organic layer.

With regard to claim 27, Ross discloses the structure further comprising an organic dielectric layer on each one or more alternating inorganic layer (d) between the vias and under the additional metal lines of the alternating organic layer; and an inorganic dielectric on each one or more organic dielectric layer between the additional metal lines of the additional organic layer.

With regard to claim 28, Ross discloses the metal lines and vias have a barrier metal on one or more edges thereof.

With regard to claim 29, Ross discloses a dielectric coated substrate which comprises;

- a first dielectric composition film (4) on a surface of a substrate (2);

- a second dielectric composition film (6) on the first dielectric composition film;

- wherein the first dielectric composition and the second dielectric composition have substantially different etch resistance;

- wherein either the first dielectric composition film is organic and the second dielectric composition film is inorganic; or the first dielectric composition film is inorganic and the second dielectric composition film is organic; and wherein the inorganic dielectric composition film comprises an inorganic dielectric selected from the group consisting of hydrosiloxanes, inorganic hydrosilsesquioxanes and combinations thereof;

wherein the hydrogensiloxanes have the formula $[\text{HSiO}_{1.5})_x\text{O}_y]_n$, and the hydrogensilsesquioxanes have the formula $(\text{HSiO}_{1.5})_n$, wherein x = about 6 to about 20, y = 1 to about 3, and n = 1 to about 4,000. Note that because two films have different dielectric composition, it is inherent that they have substantially different etch resistance.

With regard to claim 30, Ross discloses the first dielectric composition film (116) is organic and the second dielectric composition film (118) is inorganic.

With regard to claim 31, Ross discloses the first dielectric composition film (118) is inorganic and the second dielectric composition film (116) is organic.

3. Claims 23-25 and 28-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Havemann et al. (PN 6,278,174).

Havemann et al. discloses, as shown in Figures 1e, 2d, and 3c, an integrated circuit structure which comprises a substrate (102) and an organic layer (332) on a surface of the substrate which comprises a pattern of metal lines (112,114,116,118,120) on the substrate and an organic dielectric on the substrate surface between the metal lines; and an inorganic layer (342) on the organic layer which comprises an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof, having metal filled vias (160) therethrough which connect to the metal lines of the organic layer, wherein hydrogensilsesquioxanes have the formula as claimed.

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With regard to claim 24, Havemann et al. discloses the structure comprises,

an additional organic layer on the inorganic layer which comprises a pattern of additional metal lines on the inorganic layer and an organic dielectric on the inorganic layer between the additional metal lines;

an additional inorganic layer on the additional organic layer which comprises an inorganic dielectric having metal filled vias therethrough which connect to the additional metal lines of the additional organic layer.

With regard to claim 25, Havemann et al. discloses the structure comprises one or more further alternating organic layers (c) and inorganic layers (d) on the additional organic layer (c) and inorganic layer (d).

With regard to claim 28, Havemann et al. discloses the metal lines and vias have a barrier metal on one or more edges thereof.

With regard to claim 29, Havemann et al. discloses a dielectric coated substrate which comprises;

a first dielectric composition film (332) on a surface of a substrate (102,402);

a second dielectric composition film (342) on the first dielectric composition film;

wherein the first dielectric composition and the second dielectric composition have substantially different etch resistance;

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wherein either the first dielectric composition film is organic and the second dielectric composition film is inorganic; or the first dielectric composition film is inorganic and the second dielectric composition film is organic; and wherein the inorganic dielectric composition film comprises an inorganic dielectric selected from the group consisting of hydrogensiloxanes, inorganic hydrogensilsesquioxanes and combinations thereof.. Note that because two films have different dielectric composition, it is inherent that they have substantially different etch resistance, and wherein hydrogensilsesquioxanes have the formula as claimed.

With regard to claim 30, Havemann et al. discloses the first dielectric composition film (332) is organic and the second dielectric composition film (342) is inorganic.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 23-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao (PN 6,071,809, of record) in view of Rose (PN 6,207,555, of record).

Zhao discloses, as shown in Figures 3a – 6, an integrated circuit structure which comprises a substrate (302) and an organic layer (316, upper portion of 602) on a surface of the substrate which comprises a pattern of metal lines on the substrate and an organic dielectric on the substrate surface between the metal lines; and an inorganic layer (lower portion of 604 that is

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equivalent to 310) on the organic layer which comprises an inorganic dielectric selected from the group consisting of silsesquioxanes, having metal filled vias therethrough which connect to the metal lines of the organic layer.

Zhao does not disclose silsesquioxane is hydrogensilsesquioxanes having a formula as claimed. However, Ross discloses a silsesquioxane comprising hydrogensilsesquioxanes having a formula as claimed. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the silsesquioxane of Zhao comprising hydrogensilsesquioxanes having a formula as claimed, such as taught by Ross because hydrogensilsesquioxanes have lower dielectric constant and are commonly used as interlevel dielectric layer.

With regard to claim 24, Zhao and Rose disclose the structure comprises,

an additional organic layer on the inorganic layer which comprises a pattern of additional metal lines on the inorganic layer and an organic dielectric on the inorganic layer between the additional metal lines;

an additional inorganic layer on the additional organic layer which comprises an inorganic dielectric having metal filled vias therethrough which connect to the additional metal lines of the additional organic layer.

With regard to claim 25, Zhao and Rose disclose the structure comprises on or more further alternating organic layers (c) and inorganic layers (d) on the additional organic layer (c) and inorganic layer (d).

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With regard to claim 26, Zhao and Rose disclose the structure further comprising an organic dielectric layer on the inorganic layer between the vias and under the additional metal lines of the additional organic layer; and an inorganic dielectric on the organic dielectric layer between the additional metal lines of the additional organic layer.

With regard to claim 27, Zhao and Rose disclose the structure further comprising an organic dielectric layer on each one or more alternating inorganic layer (d) between the vias and under the additional metal lines of the alternating organic layer; and an inorganic dielectric on each one or more organic dielectric layer between the additional metal lines of the additional organic layer.

With regard to claim 28, Zhao and Rose disclose the metal lines and vias have a barrier metal on one or more edges thereof.

With regard to claim 29, Zhao discloses a dielectric coated substrate which comprises;

- a first dielectric composition film (310) on a surface of a substrate (302);

- a second dielectric composition film (316) on the first dielectric composition film;

- wherein the first dielectric composition and the second dielectric composition have substantially different etch resistance;

- wherein either the first dielectric composition film is organic and the second dielectric composition film is inorganic; or the first dielectric composition film is inorganic and the second dielectric composition film is organic; and wherein the inorganic dielectric composition film

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comprises an inorganic dielectric selected from the group consisting of silsesquioxane. Note that because two films have different dielectric composition, it is inherent that they have substantially different etch resistance.

Zhao does not disclose silsesquioxane is hydrogensilsesquioxanes having a formula as claimed. However, Ross discloses a silsesquioxane comprising hydrogensilsesquioxanes having a formula as claimed. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the silsesquioxane of Zhao comprising hydrogensilsesquioxanes having a formula as claimed, such as taught by Ross because hydrogensilsesquioxanes have lower dielectric constant and are commonly used as interlevel dielectric layer.

With regard to claim 30, Zhao and Rose disclose the first dielectric composition film (116) is organic and the second dielectric composition film (118) is inorganic.

With regard to claim 31, Zhao and Rose disclose the first dielectric composition film (118) is inorganic and the second dielectric composition film (116) is organic.

Response to Arguments

5. Applicant's arguments filed 4/23/02 have been fully considered but they are not persuasive.

It is argued, at page 6 of the Remarks, that layer 316 of Zhao is not located on a surface of the substrate. This argument is not convincing because Zhao discloses layer 316 is on the surface of

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the substrate 302. Note that the layer 316 is not in direct contact with the substrate surface, however, it is still located on the substrate surface.

It is argued, at page 8 of the Remarks, that an organic layer of Ross is not located on a surface of the substrate. This argument is not convincing because Rose discloses the organic layer 4 located on a surface of the substrate 2. Note that the organic layer is not in direct contact with the substrate surface, however, it is still located on the substrate surface.

It is argued, at page 9 of the Remarks, that while Ross does mention that it is preferred that the first and second dielectric layers be different than each other, this does not necessarily indicate that one dielectric layer must be organic while the other layer is inorganic. This argument is not convincing because Rose does not disclose one dielectric layer is organic and the other layer is inorganic, respectively.

Applicant's arguments about the restriction filed 11/19/01 have been fully considered but they are not persuasive. Note Office Action # 5, 8, 14, and MPEP section 806. Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

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Conclusion

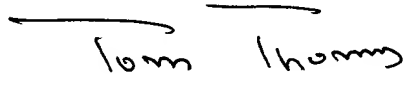
6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (703) 308-4079. The examiner can normally be reached on Mon-Thurs 7:00-5:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

August 8, 2002


TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800